

A New Species of *Mopalia* (Polyplacophora: Mopaliidae) from the Northeast Pacific

by

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Abstract. A new species of chiton, *Mopalia ferreirai*, is described from the shallow subtidal waters (0-18 m) of the Pacific coast of North America. Specimens are of medium size for the genus and resemble *Mopalia spectabilis* Cowan & Cowan, 1977, but differ in the structure of the girdle hairs.

INTRODUCTION

For many years an undescribed species of the genus *Mopalia* Gray, 1847, has been known to malacologists in the Pacific Northwest. It has often been erroneously identified as *Mopalia swanii* Carpenter, 1864, *M. spectabilis* Cowan & Cowan, 1977, or *M. lowei* Pilsbry, 1918, to which it is closely related. On recent trips to southeastern Alaska I have collected many specimens of this species. An examination of these along with other specimens from throughout the region (Alaska to central California) confirmed that it was indeed a new species, which is described here.

Abbreviations used in text are LACM, Los Angeles County Museum of Natural History; USNM, United States National Museum of Natural History, Washington, DC; CAS, California Academy of Sciences, San Francisco; SBMNH, Santa Barbara Museum of Natural History; ZIAS, Zoological Institute, Academy of Sciences, Leningrad; RMNH, Rijksmuseum van Natuurlijke Historie, Leiden; UMMZ, University of Michigan Museum of Zoology, Ann Arbor; ANSP, Academy of Natural Sciences, Philadelphia; RNC, private collection of Roger N. Clark; BMNH, British Museum of Natural History, London.

TAXONOMY

Class POLYPLACOPHORA Gray, 1821

Order NEOLORICATA Bergenhayn, 1955

Family MOPALIIDAE Dall, 1889

Genus *Mopalia* Gray, 1847

Type species: *Chiton hindsii* Reeve, 1847.

Mopalia ferreirai Clark, sp. nov.

(Figures 1-5, 12, 13)

Mopalia lowei, non Pilsbry: BURGHARDT & BURGHARDT, 1969: cover, pl. 4, no. 62, 63; SMITH, 1977:251 (from Sitka, Alaska).

Diagnosis: Chitons of medium size (up to 5 cm), variably colored, carinate, beaked: tegmentum microgranular; central areas reticulate; lateral areas weakly elevated, well defined and finely beaded; mucro posterior one-third. Girdle moderately wide (about one-half the width of valve five), armed with short, very spinose setae. Radula mopalioid, with large tricuspid major laterals.

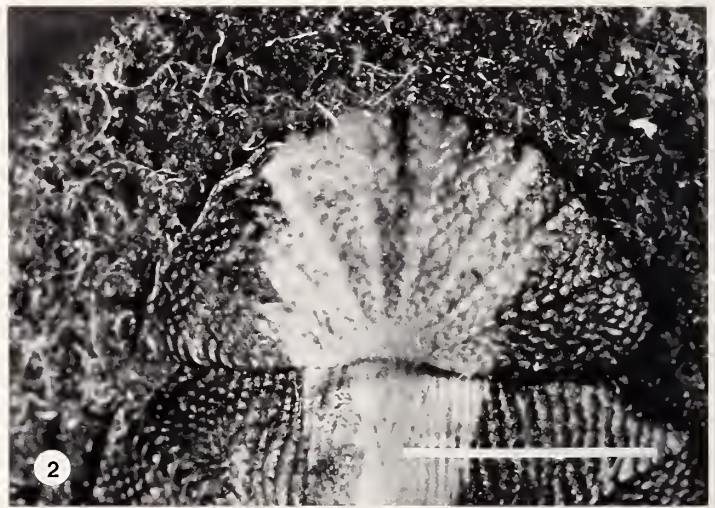
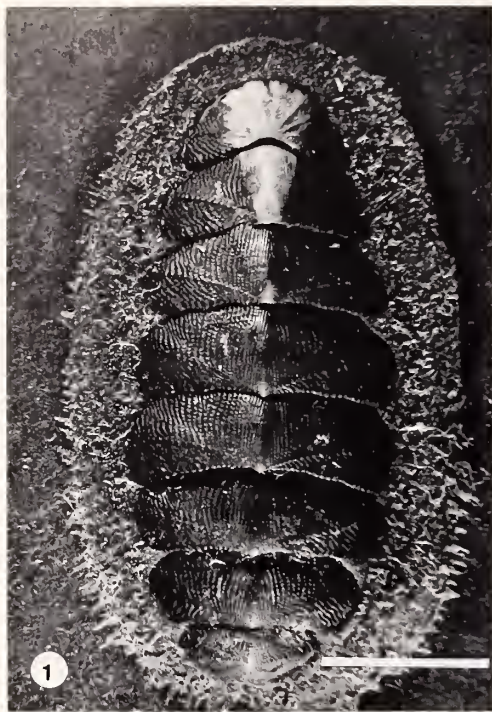
Type material: Holotype (LACM 2329) and 18 paratypes (3, LACM 2330); (2, CAS 069315); (1, SBMNH 35141); (2, USNM 860484); (1, ZIAS 1931); (2, UMMZ 252311, 252312); (1, RMNH 9236); (1, ANSP A-13392); and 5 in the collection of the author (RNC 269, 538).

Holotype and 11 paratypes are preserved dry (with glycerin), flat, and fully extended; collected 17 August 1986 by R. N. Clark. Seven additional paratypes, also flat and fully extended, are preserved in 70% isopropyl alcohol; collected 28 August 1990.

Type locality: Rotary Beach, 5 km S of Ketchikan, Revillagigedo Island, Alaska (55°16'N, 131°34'W), 0.5 to 1 m, on the bottoms of large rocks.

Description: Holotype (Figures 1-4) dry preserved, flat, fully extended; dimensions (including girdle) 41.0 mm in

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Explanation of Figures 1 to 4

Figures 1-4. *Mopalia ferreirai* Clark, sp. nov., holotype.

Figure 1. Whole animal (dorsal view), bar = 1 cm.

Figure 2. Anterior valve, bar = 5 mm.

Figure 3. Intermediate valves ii-iv (left side), bar = 3 mm.

Figure 4. Posterior valve, bar = 4 mm.

length, 24.0 mm in width, and 7.0 mm in elevation; jugal angle about 110°; valves carinate, moderately elevated, and slightly beaked. Color overall reddish-brown, with yellowish tint on older portion of shell; central portion of anterior valve, and jugum of second valve white. Anterior valve (Figure 2): 11.0 mm in width and bearing 10 rows (2 marginal and 8 intermediate) of low, rounded pustules, about 14 in a series (apex eroded); interstices with 3–8 radiating rows of low, smooth pustules. Intermediate valves (Figure 3): valve five 16.0 mm in width and 8.0 mm in length (including sutural laminae); central areas with 22–24 longitudinal ribs per side of jugum, transversed by smaller, slightly upwardly diverging ribs giving fine but crisp pitted appearance; lateral areas very slightly raised, defined by one row of pustules similar to those on anterior valve; surface of lateral areas with 8–10 staggered, radiating rows of low, smooth pustules; posterior margin of valves with backwards and slightly upwardly directed elongate-oval pustules. Posterior valve (Figure 4): 10.0 mm in width (tegmentum 8.5 mm in width) and 6.0 mm in length (including sutural laminae); mucro posterior one-third and raised; premucronal area with 18 longitudinal ribs crossed by much finer (nearly obsolete) transverse ribs; postmucronal area obsoletely sculptured like lateral areas. Articulamentum translucent white, tinted with faint blue-green at apices. Slit formula typical for genus, 8/1/2, slits in posterior valve separated by a moderately wide caudal sinus; sutural laminae moderately long and rounded; insertion teeth long and well formed, and bearing fine vertical striations on outside surface. Girdle (Figure 5): moderately wide, about 4.5 mm at valve five, moderately encroaching at sutures, light brown; covered with very fine spicules up to 150 μm in length, occurring singly or in groups of up to 10, and with tiny scales that are striated along the upper one-fourth; scales on dorsal surface measuring 45 μm in length and 8 μm in width, those on ventral surface measuring 80 μm in length and 12 μm in width; girdle also bearing short (up to 2.0 mm), flattened setae armed with numerous rows of chitinous bristles, generally three rows on dorsal surface and one each on lateral surfaces. Radula (Figure 12): preserved separately, in 70% isopropyl alcohol, 13 mm in length and bearing about 28 mature rows of teeth; central tooth rectangular, though somewhat tapered on the lower one-third, 300 μm in length, cutting edge about 150 μm in width; minor lateral teeth triangular, about 300 μm in length; major laterals very large, about 800 μm in length and bearing one large tricuspid head about 300 μm in length and 180 μm in width, central cusp the largest, inner cusp slightly smaller, and outer cusp slightly more than one-half length of central one; first marginal teeth large and angular, bearing large hornlike projection on inner lateral margin, dimensions 350 μm by 260 μm ; spatulate (third) marginal teeth large, about 625 μm in length and 75 μm in width; outer marginals rounded, diamond shaped, about 430 μm in length and 210 μm in width. Gills merobranchial, abanal, extending three-fourths length of foot; about 30 plumes per side.

5



1.0mm

6



1.0mm

7



1.0mm

8



1.0mm

Explanation of Figures 5 to 8

Figure 5. *Mopalia ferreirai* Clark, sp. nov. (Annette Id., Alaska; RNC 867). Single seta with bristles.

Figure 6. *Mopalia swanii* Carpenter, 1864 (Neah Bay, Washington; RNC 202). Single seta with bristles.

Figure 7. *Mopalia spectabilis* Cowan & Cowan, 1977 (Coos Bay, Oregon; RNC 354). Single seta with bristles.

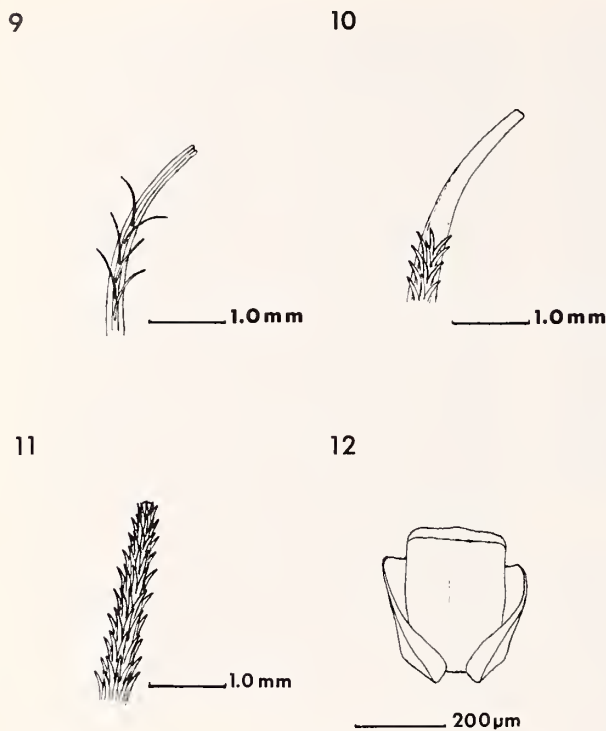
Figure 8. *Mopalia acuta* (Carpenter, 1855) (Point Conception, California; RNC 444). Single seta with bristles.

Variation: Girdle: In some specimens the setae bear a few spines on the ventral as well as the dorsal and lateral surfaces, but this is rare.

Coloration: The tegmental coloration may be uniform or nearly uniform rose, violet, light blue, green, yellow, reddish-brown, or orange. Alternatively, it may be maculated with these colors or with black, tan, white, or brown. Some specimens have one or more unicolored valves and the rest varicolored. A common variant has a blue-green ground color maculated with reddish-brown and occasionally white.

Distribution: *Mopalia ferreirai* has been found continuously between latitudes 60°N (Prince William Sound, Alaska) and 36°N (Carmel Bay, Monterey County, California) (Figure 13) and from a bathymetric range of +0.5 m in the north to at least 18 m in the southern portion of its geographic range. It is usually found on the bottoms of large rocks.

Etymology: Named in honor of the late Dr. Antonio J.



Explanation of Figures 9 to 12

Figure 9. *Mopalia seta* Yakovleva, 1952 (Sea of Japan; RNC 482). Single seta with bristles.

Figure 10. *Mopalia ciliata* (Sowerby, 1840) (Point Conception, California; RNC 208). Single seta with bristles.

Figure 11. *Nopalia lowei* Pilsbry, 1918 (Shell Beach, California; RNC 288). Single seta with bristles.

Figure 12. *Mopalia ferreirai* Clark, sp. nov., holotype. Central and minor lateral teeth.

Ferreira, who greatly expanded our knowledge of this fascinating group of mollusks.

DISCUSSION

Because of the taxonomic confusion associated with the genus *Mopalia*, it was necessary to examine the type material (either directly or via photographs) of as many of the similar-appearing species as could be obtained. These were as follows: *Mopalia lowei* Pilsbry, 1918 (ANSP 117951), *Mopalia spectabilis* Cowan & Cowan, 1977 (paratype RNC 223, ex I. McT. Cowan 10593), *Chiton acutus* Carpenter, 1855 (holotype, BMNH 61.5.20.103; illustrated by PALMER, 1958:pl. 31, fig. 18).

The type of *Mopalia swanii* Carpenter, 1864, is lost (PALMER, 1958:283), and present identifications of this species are based on BERRY (1951:214-217, 219, pl. 26, fig. 15). The type of *Chiton ciliatus* Sowerby, 1840, was not examined because the original description (republished by Pilsbry in 1892) is adequate for recognizing this species. The type of *Mopalia seta* Yakovleva, 1952, is at the ZIAS,

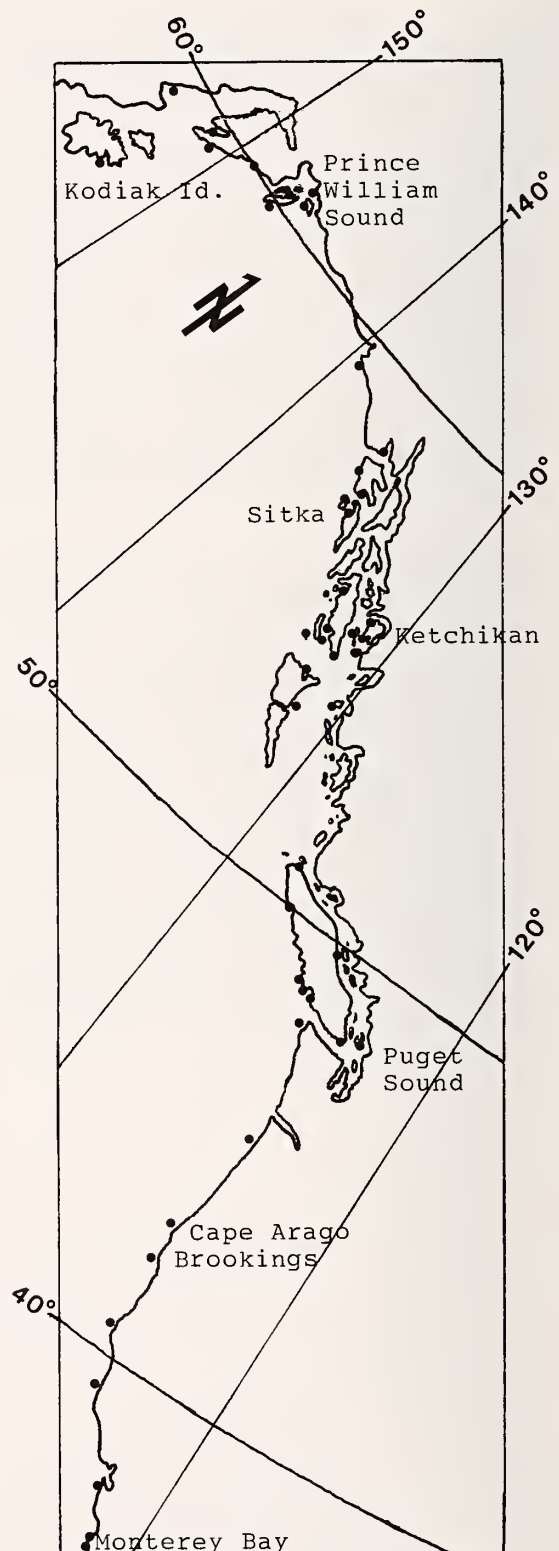


Figure 13

Mopalia ferreirai Clark, sp. nov. Distribution map.

and was not examined, but Dr. B. I. Sirenko of that institution provided me with four specimens of this species (all collected and identified by him) that agree very well with the original description.

On the basis of seta structure, *Mopalia ferreirai* belongs in the same species group as: *M. acuta* (Carpenter, 1855), found from central California to Baja California Norte, Mexico; *M. swanii* Carpenter, 1864, found from Unalaska Island, Alaska, to Malibu, California; *M. spectabilis* Cowan & Cowan, 1977, found from Kodiak Island, Alaska, to Point Conception, California; and *Mopalia seta* Yakovleva, 1952, which is restricted to the Sea of Japan. This group is characterized by thick setae (0.5 to >1.0 mm in width at the base in specimens over 25 mm in length) bearing chitinous bristles. This group is clearly distinct from the group—comprised of *Mopalia ciliata* (Sowerby, 1840), found from Kamchatka to Baja California Norte, Mexico, and *M. lowei* Pilsbry, 1918, found from Bodega Bay, California, to Baja California Norte, Mexico—characterized by thick setae (0.5 to >1.0 mm in width at the base in specimens over 25 mm in length) bearing calcareous spines. These two groups were separated by immersing the setae from each species in a solution of hydrochloric acid, which dissolves calcareous spines. This difference in setal composition is regarded as a provisional indication that the *M. acuta* and *M. ciliata* groups are natural assemblages, but this view awaits additional corroboration.

Mopalia ferreirai may be distinguished from the other four members of the *M. acuta* group by the presence of short, flattened (sometimes slightly trough-shaped) setae bearing three rows of short, thick, curved bristles on the dorsal surface and one row each on the lateral surfaces. All other members of the *M. acuta* have strongly trough-shaped setae. *Mopalia acuta* (Figure 8) has one row of long, fine, curved bristles originating in the trough; *M. swanii* (Figure 6) has two rows of long, curved bristles, one each originating on the inner lateral surface of the setae; and *M. spectabilis* (Figure 7) has very long setae (up to 6.0 mm in length) bearing five rows of very long (up to 1.0 mm), curved bristles. In *M. seta* the trough is reduced to a narrow groove from which arises a single row of very long, fine, curved bristles.

Mopalia ciliata (Figure 10) has flattened or slightly trough-shaped setae that are usually strongly recurved, and bear three rows of short, stout, white spines, not extending beyond one-half the length of the seta. *Mopalia lowei* (Figure 11) has long (up to 5.0 mm) thick, tapering, shaftlike (round) setae bearing rather short, sharp spines all the way around the axis, about 6–9 per axial row (increasing in number with the size of the seta).

Mopalia ferreirai and *M. lowei* are superficially similar, particularly in the spinose appearance of their setae. But the tegmental sculpture of *M. lowei* is much stronger. Also, the spines of *M. lowei* (and *M. ciliata*) are white, whereas the spines of *M. ferreirai* and all of the members of the *M. acuta* group are light brown, golden, or tan.

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